# THE SEASONAL DISTRIBUTION OF SWINE BREEDING

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1. In any analysis of the food resources of a nation the stock and production of swine constitutes a highly important factor. The hog is the primary source of nutrient fat in this country. Considering human food alone, or in other words disregarding fodders and feeds, fat for human nutritive use is derived in about the proportions shown in the following table from all sources.

TABLE I

SOURCES OF FAT, IN CHEMICAL SENSE, PRODUCED FOR HUMAN FOOD IN 1913–1914 IN THE UNITED STATES

| Sources | Tons of Nutrient Fat Produced in 1913–14 | Percentage Distribution |
|---|---|---|
| Pork | 2,413,763 | 41.3 |
| Dairy products | 1,721,748 | 29.5 |
| All vegetable foods[1] (excluding fodders and feeds) | 982,964 | 16.8 |
| Beef | 486,373 | 8.3 |
| Eggs | 131,250 | 2.2 |
| Mutton and lamb | 90,405 | 1.5 |
| Veal | 14,679 | .3 |
| Total | 5,841,182 | 99.9 |

From this table the paramount position of pork in our national fat supply is evident. It is clear that any one having the task of safeguarding our food resources must give large attention to the pork supply.

The hog is an animal which reproduces itself relatively rapidly. The duration of gestation is about sixteen weeks, and the sow can be bred any time in the year. Consequently, it is theoretically possible to keep an even flow of additions to the swine population throughout the year. In dealing with the problem of our future pork supply, however, the question arose as to whether, in fact, hogs were bred in this country in such a way as to result in an even birth-rate throughout the year, or whether the breeders' practise was such as to lead to more

[1] Including, of course, cottonseed and corn oils.

births in certain seasons than in others. A special investigation of the point was made, with the results here set forth.

2. To arrive at reliable and representative data as to the birth dates of the swine population recourse was had to the registry records of pure-bred swine of two breeds, the Poland China and the Duroc Jersey. These breeds were chosen because of their popularity and wide geographical distribution in the United States. Frequency distributions of date of birth of litters, by month, were made by extracting at random litter records from the American Poland China Record (Vols. 17 and 18) and the Duroc Jersey Record (Vol. 40). Equal numbers of male and female records were taken. For the purpose of this inquiry the country was divided in four zones on the basis of latitude as follows:

*Zone I., Northern Zone*—includes Maine, New Hampshire, Vermont, Massachusetts, New York, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Washington.

*Zone II., North Central Zone*—includes Rhode Island, Connecticut, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, Wyoming, Idaho, Oregon.

*Zone III., South Central Zone*—includes Delaware, Maryland, Virginia, West Virginia, Kentucky, Missouri, Kansas, Colorado, Utah, Nevada, California.

*Zone IV., Southern Zone*—includes North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, Texas, New Mexico, Arizona.

For each zone and breed 500 records were taken at random from the herd books, giving 2,000 records for each breed in total. I am indebted to my assistant, Mr. John Rice Miner, for extracting these records.

TABLE II

FREQUENCY DISTRIBUTIONS, BY ZONES AND MONTHS OF BIRTH, OF 2,000 LITTERS OF POLAND CHINA SWINE

| Month of Birth | Births in Zone I | Births in Zone II | Births in Zone III | Births in Zone IV | All Zones |
|---|---|---|---|---|---|
| January | 1 | 3 | 7 | 41 | 52 |
| February | 13 | 24 | 37 | 34 | 108 |
| March | 103 | 166 | 77 | 48 | 394 |
| April | 239 | 134 | 110 | 84 | 567 |
| May | 86 | 60 | 64 | 58 | 268 |
| June | 17 | 16 | 42 | 37 | 112 |
| July | 8 | 2 | 36 | 33 | 79 |
| August | 7 | 25 | 29 | 26 | 87 |
| September | 10 | 32 | 36 | 32 | 110 |
| October | 11 | 28 | 42 | 46 | 127 |
| November | 3 | 6 | 8 | 39 | 56 |
| December | 2 | 4 | 12 | 22 | 40 |
| Totals | 500 | 500 | 500 | 500 | 2,000 |

3. The frequency distributions are given in Tables II. and III.

TABLE III

FREQUENCY DISTRIBUTIONS, BY ZONES AND MONTHS OF BIRTH, OF 2,000 LITTERS OF DUROC JERSEY SWINE

| Month of Birth | Births in Zone I | Births in Zone II | Births in Zone III | Births in Zone IV | All Zones |
|---|---|---|---|---|---|
| January | 5 | 9 | 14 | 29 | 57 |
| February | 13 | 41 | 26 | 10 | 90 |
| March | 189 | 230 | 168 | 90 | 677 |
| April | 170 | 87 | 87 | 114 | 458 |
| May | 53 | 13 | 34 | 61 | 161 |
| June | 13 | 8 | 24 | 56 | 101 |
| July | 5 | 5 | 13 | 28 | 51 |
| August | 6 | 20 | 25 | 12 | 63 |
| September | 21 | 46 | 51 | 19 | 137 |
| October | 13 | 22 | 39 | 29 | 103 |
| November | 4 | 11 | 15 | 24 | 54 |
| December | 8 | 8 | 4 | 28 | 48 |
| Totals | 500 | 500 | 500 | 500 | 2,000 |

These frequency distributions are shown graphically in Fig. 1.

Tables IV. and V. give the necessary frequency constants for the distributions.

TABLE IV

FREQUENCY CONSTANTS FOR BIRTH DATES OF POLAND CHINA SWINE

| Zone | Mean Date of Birth | Standard Deviation in Date of Birth |
|---|---|---|
| I | April 26 ± 1.46 days | 48.50 ± 1.03 days |
| II | May 7 ± 2.17 days | 71.79 ± 1.53 days |
| III | June 1 ± 2.43 days | 80.60 ± 1.72 days |
| IV | June 12 ± 2.95 days | 97.88 ± 2.09 days |

TABLE V

FREQUENCY CONSTANTS FOR BIRTH DATES OF DUROC JERSEY SWINE

| Zone | Mean Date of Birth | Standard Deviation in Date of Birth |
|---|---|---|
| I | April 24 ± 1.87 days | 61.04 ± 1.32 days |
| II | May 2 ± 2.45 days | 81.28 ± 1.73 days |
| III | May 20 ± 2.56 days | 84.74 ± 1.81 days |
| IV | May 31 ± 2.69 days | 89.24 ± 1.90 days |

4. From these tables and diagrams certain conclusions are at once evident.

(*a*) There is clearly considerable difference in breeding practise in different latitudes in this country. In the northernmost zone (I.) the majority of sows are bred to farrow in the spring months March and April, but there is a slight indication of bimodality of the seasonal distribution curve, with the sec-

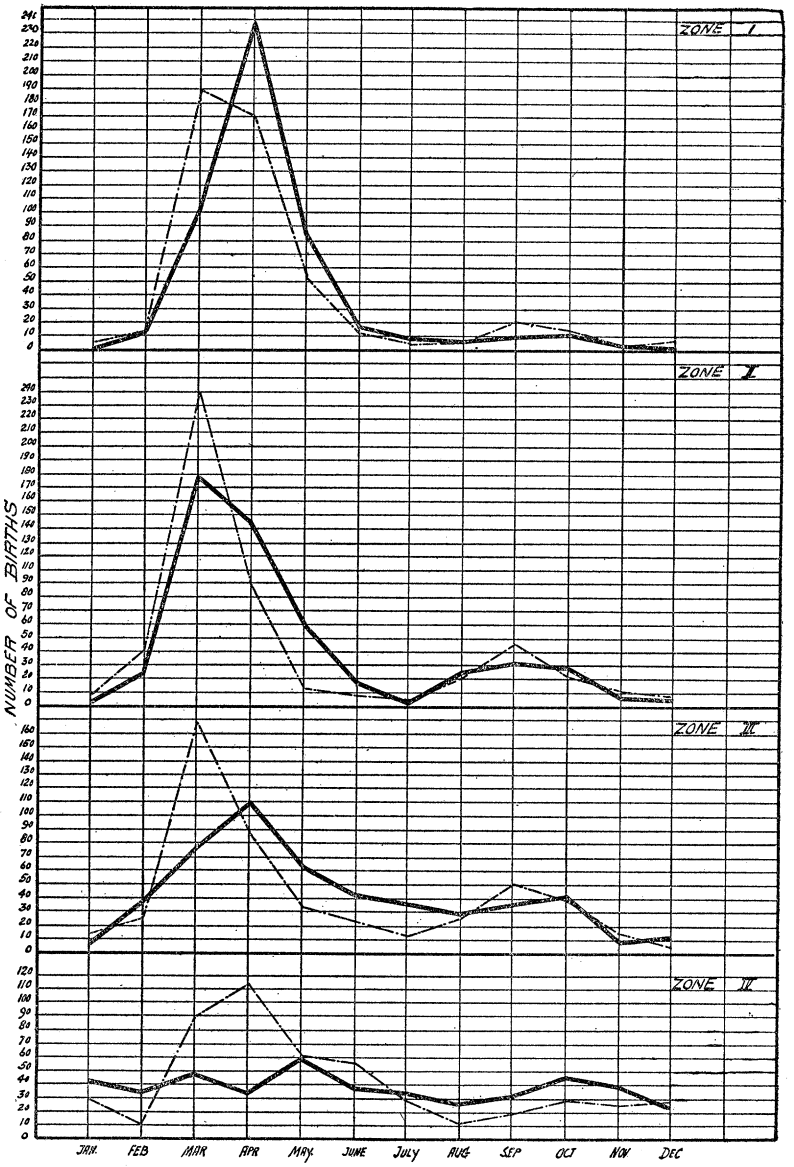


FIG. 1. Frequency polygons showing the seasonal distribution of birth dates in Poland China (solid line) and Duroc Jersey (dash line) swine.

ond peak in the autumn months September and October. In the North Central Zone (II.) this tendency to bimodality becomes much more pronounced and there is a distinct second peak produced by the farrowing in the autumn. As we proceed to the South Central (III.) and Southern (IV.) Zones the curve becomes more and more flat topped, indicating less and less tendency to segregate the breeding period to any one particular season of the year. The spring mode, however, is not entirely lost, even in the southernmost zone.

(*b*) The effect of this tendency to a secondary autumn farrowing season is to advance the average birth date of swine as we proceed from north to south. In the case of the Poland China records this difference in mean birth dates between the north and south amounts, in the extreme, to about a month and a half, and in the Duroc Jerseys to about a month. Another result of the same tendency is, of course, to make the variations in birth dates, as indicated by the standard deviation, larger as we proceed southward.

(*c*) While there are minor differences in the distribution for the two breeds, it is clear that the breeding follows substantially the same rule in both. The maximum difference is in Zone IV., where there is a difference of $12 \pm 3.99$ days between the means, an amount almost exactly 3 times the probable error, and of doubtful significance.

(*d*) To get a rough but sufficiently accurate general index of hog breeding conditions we may combine the figures for the two breeds. This process gives the distributions exhibited in Table VI.

TABLE VI

MONTHLY DISTRIBUTION OF BIRTHS BOTH BREEDS COMBINED

| Month | Frequency | | | | |
|---|---|---|---|---|---|
| | Zone I | Zone II | Zone III | Zone IV | All Zones |
| January | 6 | 12 | 21 | 70 | 109 |
| February | 26 | 65 | 63 | 44 | 198 |
| March | 292 | 396 | 245 | 138 | 1,071 |
| April | 409 | 221 | 197 | 198 | 1,025 |
| May | 139 | 73 | 98 | 119 | 429 |
| June | 30 | 24 | 66 | 93 | 213 |
| July | 13 | 7 | 49 | 61 | 130 |
| August | 13 | 45 | 54 | 38 | 150 |
| September | 31 | 78 | 87 | 51 | 247 |
| October | 24 | 50 | 81 | 75 | 230 |
| November | 7 | 17 | 23 | 63 | 110 |
| December | 10 | 12 | 16 | 50 | 88 |
| Totals | 1,000 | 1,000 | 1,000 | 1,000 | 4,000 |

(*e*) The essentially bimodal character of the swine breeding curve appears clearly from Table VI. There is a distinct autumn mode but it is only from 20 to 25 per cent. as high as the spring mode. Broadly speaking about three fourths of all the pigs are born in the first half of the year.

According to the official statistics of the Department of Agriculture nearly one half of the country's total hog population is included in our Zone II.[2] Probably this zone contributes two thirds to three quarters of the commercially slaughtered hogs. In Zone II. the following relations hold:

47.3 per cent. of all pigs are born between January 1 and April 1.
69.4 per cent. of all pigs are born between January 1 and May 1.
76.7 per cent. of all pigs are born between January 1 and June 1.

Or, in other words, in the chief swine growing region of the country nearly one half of the pigs are born in the first quarter of the year, and over three quarters of the whole number of pigs are born in the first five months of the year. This assumes of course that we may take the samples of the two breeds here dealt with as indicative of the whole population, which I think we can to a sufficient degree of accuracy.

5. It is of interest now to consider the marketing or slaughter curve for hogs. The Bureau of Animal Industry of the Department of Agriculture maintains some nine hundred stations throughout the country for the inspection of all meat animals received for slaughter. These stations do not cover all the slaughter in the country, but only that of the larger centers slaughtering for interstate shipments; however, they represent in the case of hogs 58.9 per cent. and in the case of cattle 56.4 per cent. of the total slaughter of the country, as determined from the 1910 census.

The following table presents the average percentage that each month's inspection bears to the total for the calendar year, computed from the reported inspections for the six years ending December 31, 1916.

The percentages of Table VII. are shown graphically in Fig. 2, on which is also given for comparison the birth curve in terms of percentage.

From the table and the diagram it is evident that the slaughter follows a very different curve than the births. The most essential point of difference is that the slaughter is much more evenly distributed over the year than the births. The

[2] Cf. Finch, V. C., and Baker, O. E., "Geography of the World's Agriculture," U. S. Dept. Agr., 1917, pp. 130–132.

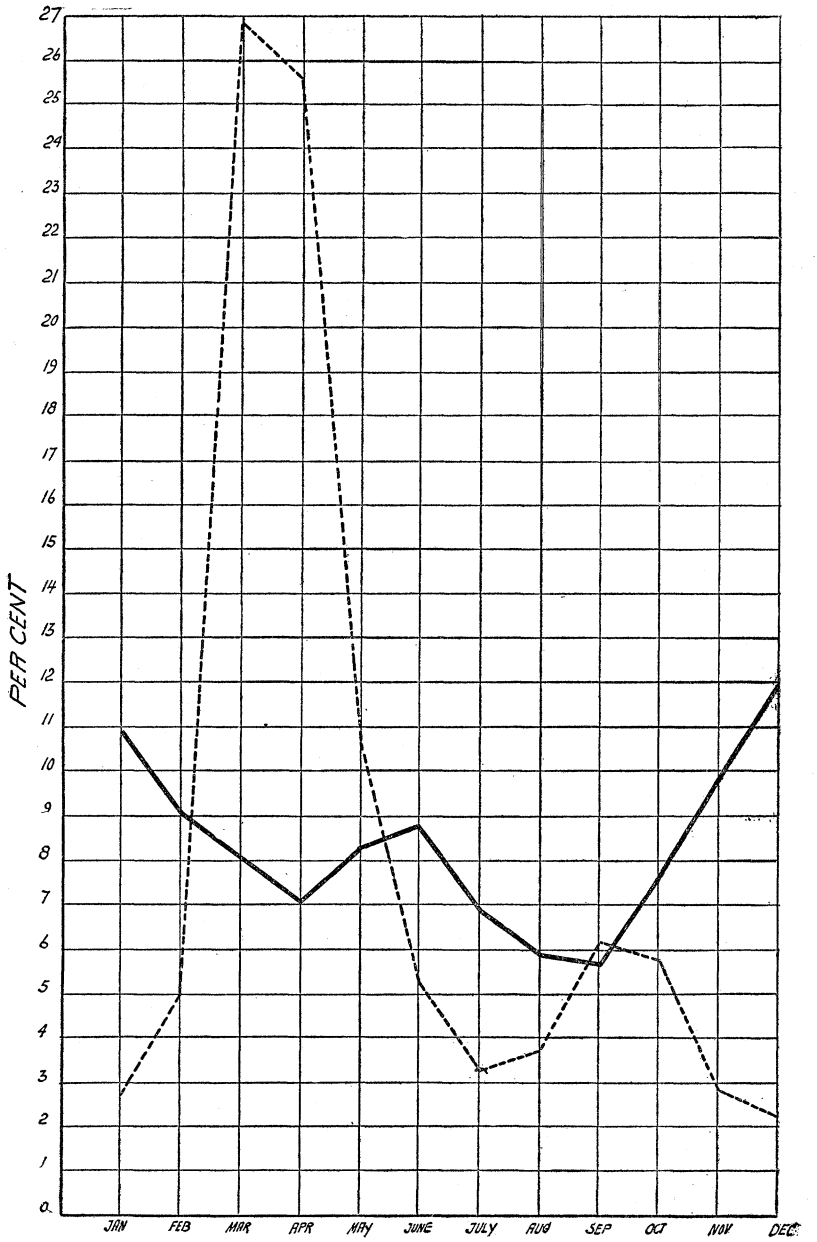


FIG. 2. Diagram showing the monthly slaughter under inspection (solid line) of hogs, expressed as percentage of total slaughter for the year, in comparison with the monthly birth rate (dash line), again expressed as percentage of the year's total.

TABLE VII

INSPECTION FOR SLAUGHTER

*Per Cent. that each Month bears to Total for the Calendar Year*

| Month | Hogs |
|---|---|
| January | 10.97 |
| February | 9.07 |
| March | 8.08 |
| April | 7.10 |
| May | 8.22 |
| June | 8.74 |
| July | 6.89 |
| August | 5.82 |
| September | 5.64 |
| October | 7.13 |
| November | 9.88 |
| December | 11.98 |

former curve shows no such violent fluctuations as the latter. During the hot months of the year, July, August and September, the shipments are only about one half those of the winter months, because properly conditioned hogs will not stand shipment and losses are heavy. As the cooler weather comes on, the heavier movement begins and reaches its maximum in December and January, with a decline in each of the succeeding months until May and June, when there is another increase. The two high points of the year in December and June reflect the marketing of the two crops of pigs, spring and autumn, that are produced each year, but in a much reduced degree.

6. What the above facts mean is that there is much more variability on the part of the farmer in the finishing of his pigs than in the breeding of them. To a very considerable extent this removes the potential danger to the nation's food supply which inheres in having 41 per cent. of the nutrient fat supply produced from a source of which 75 per cent. comes into existence in less than one half of the year. The data in this paper show that for all practical purposes the danger point which wants watching is the absolute number of pigs born, not their distribution in different seasons of the year.